Homework 12

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Consider a company that allows back ordering. That is, the company notifies customers that a temporary stock-out exists and that their order will be filled shortly. What considerations might argue for such a policy? What effect does such a policy have on storage costs? Should costs be assigned to stock-outs? Why? How would you make such an assignment? What assumptions are implied by the model in Figure 13.7? Suppose a "loss of goodwill cost" of w dollars per unit per day is assigned to each stock-out. Compute the optimal order quantity Q* and interpret your model.

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Find the local minimum value of the function

$f(x,y) = 3x^2 + 6xy + 7y^2 - 2x + 4y$

d/dx:

$\frac{\partial}{\partial x}(3x^2 + 6xy + 7y^2 - 2x + 4y)$
$= 3(\frac{\partial}{\partial x}(x^2)) + 6y(\frac{\partial}{\partial x}(x)) + \frac{\partial}{\partial x}(7y^2) - 2(\frac{\partial}{\partial x}(x)) + \frac{\partial}{\partial x}(4y)$

Derivative of x is 1:

$= 3(\frac{\partial}{\partial x}(x^2)) + 6y + \frac{\partial}{\partial x}(7y^2) - 2 + \frac{\partial}{\partial x}(4y)$

Use the power rule, $\frac{\partial}{\partial x}(x^n) = nx^{n-1}$, where n = 2: $\frac{\partial}{\partial x}(x^2) = 2x$ and derivative of $4y$ = 0:

$= 3(2x) + 6y + \frac{\partial}{\partial x}(7y^2) - 2$

The derivative of $7x^2$ = 0 :

$\frac{\partial}{\partial x}(3x^2 + 6xy + 7y^2 - 2x + 47) = 6x + 6y - 2$

d/dy:

$\frac{\partial}{\partial y}(3x^2 + 6xy + 7y^2 - 2x + 47)$
$= (\frac{\partial}{\partial y}(3x^2)) + 6x(\frac{\partial}{\partial y}(y)) + 7\frac{\partial}{\partial y}(y^2) - (\frac{\partial}{\partial y}(-2x)) + 4\frac{\partial}{\partial y}(y)$

The derivative of -2x, and $3x^2$ = 0:

$= 6x(\frac{\partial}{\partial y}(y)) + 7\frac{\partial}{\partial y}(y^2) + 4\frac{\partial}{\partial y}(y)$

The derivative of y = 1:

$= 6x + 7\frac{\partial}{\partial y}(y^2) + 4$

Using the power rule :

$0 = 6x + 7 * 2y + 4 = 6x + 14y + 4$

Finding the local minima:
$0 = 6x + 6y - 2$
$-6y = 6x - 2$
$y = -x + \frac{1}{3}$

$0 = 6x + 14y + 4$
$-6x = 14y + 4$
$x = -\frac{14}{6}y - \frac{4}{6}$
$x = -\frac{14}{6}(-x + \frac{1}{3}) - \frac{4}{6}$
$x = \frac{13}{12}$

$y = -\frac{13}{12} + \frac{1}{3}$

min at (x,y) = $(\frac{13}{12}, -\frac{1}{4})$

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